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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPELLANT'S MAIN BRIEF ON APPEAL

Application No.: 10/616,716

Applicant: Momoe Adachi

Filed: July 10, 2003

Title: BATTERY

Examiner: LEE, CYNTHIA K.

Group Art Unit: 1795

Confirmation No.: 2623

Customer No.: 26263

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Sir:

In accordance with the provisions of 37 C.F.R. §41.37, Appellant submits this Main Brief on Appeal pursuant to the Notice of Appeal mailed on May 28, 2008 in the above-identified application.

The Commissioner is hereby authorized to charge the amount of $510.00 for the requisite appeal brief fee to the Appellant's Attorneys' credit card. Form 2038 is attached.

Appellant petitions the Commissioner for Patents to extend the time for filing this brief by one month so that the period for filing this brief is extended to August 28, 2008. A postal money order in the amount of $120 is attached to cover the extension fee.

The Commissioner is hereby authorized to charge any deficiency in fees associated with this communication or credit any overpayment to Deposit Account No. 19-3140. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

By: _____

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on August 28, 2008.

(Reg. No. 45,034)
Christopher P. Rauch

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Dear Sir:

In accordance with the provisions of 37 C.F.R. §41.37, Appellant submits this Main Brief on Appeal pursuant to the Notice of Appeal mailed on May 28, 2008 in the above-identified application.

I. REAL PARTY IN INTEREST:

The real party in interest in the present appeal is the Assignee, Sony Corporation. The assignment was recorded in the U.S. Patent and Trademark Office at Reel 014785, Frame 0868.

II. RELATED APPEALS AND INTERFERENCES:

Appellant is not aware of any related appeals or interferences.

III. STATUS OF CLAIMS:

Claims 1-5 and 7-19 are pending in the application. Claims 6, 20 and 21 are canceled.

The present appeal is directed to claims 1-5 and 7-19, which were finally rejected in an Office Action dated December 28, 2007.

A copy of claims 1-5 and 7-19 is appended hereto as the Claims Appendix.

The status of the claims on appeal is as follows:

A) Claims 1-5, 7-11, 13-16, and 18-20 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Kawakami (US 6,949,312)* in view of *Fujita* (WO 01/22519) and *Iwamoto (WO 00/33403)*.

B) Claim 12 is rejected under 35 U.S.C. §103(a) as being unpatentable over *Kawakami* in view of *Fujita* and *Iwamoto* as applied to claim 1, further in view of *Morigaki (US 2002/0061448)*.

C) Claim 17 is rejected under 35 U.S.C. §103(a) as being unpatentable over *Kawakami* in view of *Fujita* and *Iwamoto* as applied to claim 1, further in view of *Yoshioka (US 2001/0005558)*.

IV. STATUS OF AMENDMENTS:

All amendments have been entered in this application.

V. SUMMARY OF CLAIMED SUBJECT MATTER:

Claims 1-5 and 7-19 are currently pending. Claim 1 is the only pending independent claim under consideration. Claims 2-5 and 7-19 depend directly or indirectly from independent claim 1. Independent claim 1 is summarized below.

Referring to Figure 1 as an illustrative example, claim 1 claims a battery comprising a cathode 21, an anode 22, and an electrolyte 23 (page 5, lines 10-19; page 20, lines 3-11).

The capacity of the anode 22 includes both a capacity component obtained by insertion and extraction of a light metal and a capacity component obtained by deposition and dissolution of the light metal (page 9, lines 4-19; page 16, lines 9-21).

The electrolyte 23 contains a light metal salt having a M-O bond wherein M represents any of boron (B), phosphorus (P), aluminum (Al), gallium (Ga), indium (In), thallium (Tl), arsenic (As), antimony (Sb) or bismuth (Bi) (page 20, line 23-page 21, line 5).

The light metal is deposited on the anode 22 at an open circuit voltage lower than overcharge voltage (page 16, lines 9-21).

A ratio X/Y is at least 0.05 to at most 3.0, X is the capacity component obtained by deposition and dissolution of the light metal and Y is the capacity component obtained by insertion and extraction of the light metal (page 18, line 20-page 19, line 7).

The capacity of the anode 22 obtained by insertion and extraction of the light metal is smaller than the capacity of the cathode 21 (page 25, lines 4-13).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL:

The following grounds of rejection are to be reviewed on appeal:

A) Claims 1-5, 7-11, 13-16, and 18-20 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Kawakami (US 6,949,312)* in view of *Fujita* (WO 01/22519) and *Iwamoto (WO 00/33403)*.

B) Claim 12 is rejected under 35 U.S.C. §103(a) as being unpatentable over *Kawakami* in view of *Fujita* and *Iwamoto* as applied to claim 1, further in view of *Morigaki (US 2002/0061448)*.

C) Claim 17 is rejected under 35 U.S.C. §103(a) as being unpatentable over *Kawakami* in view of *Fujita* and *Iwamoto* as applied to claim 1, further in view of *Yoshioka (US 2001/0005558)*.

VII. ARGUMENT:

As set forth below, claims 1-5 and 7-19 are not rendered obvious under 35 U.S.C. §103 based on the teachings of various cited references. Appellant respectfully submits the Examiner's assertions are incorrect as a matter of fact and law. Thus, for the reasons set forth below, Appellant respectfully requests that this Board reverse the rejections of claims 1-5 and 7-19 under 35 U.S.C. § 103.

A. Claims 1-5, 7-11, 13-16, and 18-20 are not rendered obvious by *Kawakami* in view of *Fujita* and *Iwamoto*

Appellant respectfully submits that *Kawakami* in view of *Fujita* and *Iwamoto* fails to disclose or suggest each and every limitation of claims 1-5, 7-11, 13-16, and 18-20.

Independent claim 1 recites a battery comprising a cathode, an anode, and an electrolyte. The capacity of the anode includes both of a capacity component obtained by insertion and extraction of a light metal and a capacity component obtained by deposition and dissolution of the light metal. The electrolyte contains a light metal salt having a M-O bond wherein M represents any of boron (B), phosphorus (P), aluminum (Al), gallium (Ga), indium (In), thallium (TI), arsenic (As), antimony (Sb) or bismuth (Bi). The light metal is deposited on the anode at an open circuit voltage lower than overcharge voltage. A ratio X/Y is at least 0.05 to at most 3.0, X being the capacity component obtained by deposition and dissolution of the light metal and Y being the capacity component obtained by insertion and extraction of the light metal. The capacity of the anode obtained by insertion and extraction of the light metal is smaller than the capacity of the cathode.

Exhibit Figures (1)-(6) are submitted herewith in the attached Appendix to more clearly illustrate novel features of the claimed invention. Exhibit Figures (1)-(6) were originally submitted with the Amendment mailed on April 28, 2008. Exhibit Figure (1) depicts the insertion and extraction of light metal ions (e.g., Li+) in a conventional battery. Exhibit Figure (2) depicts a battery before charging. As shown in Exhibit Figure (2), light metal (e.g., lithium) is stored in the cathode and not in the anode. Exhibit Figure (3) depicts a first component of charging a battery by the insertion of light metal ions (e.g., Li+) to the anode. A conventional battery stops with this first component and does not include the second component of Exhibit Figure (4) that includes deposition of light metal to the anode. Exhibit Figure (4) depicts the deposition of light metal (e.g., Li) to the anode in accordance with the claimed invention. In particular, Exhibit Figure (4) illustrates the capacity of the anode obtained by insertion and extraction of the light metal (e.g., Li) being smaller than the capacity of the cathode. This

diagram also quantitatively illustrates the capacity component ("X") obtained by deposition and dissolution of the light metal (e.g., Li) and the capacity component ("Y") obtained by insertion and extraction of the light metal (e.g., Li), with the ratio X/Y being at least 0.05 to at most 3.0. As further illustrated in Exhibit Figure (5), this ratio of X to Y results in the claimed battery having improved cycle characteristics compared to the convention battery of Exhibit Figure (6).

Thus, the claimed combination of anode capacity component X/Y, light metal being deposited on the anode at an open circuit voltage lower than overcharge voltage, and the capacity of the anode obtained by insertion and extraction of the light metal being smaller than the capacity of the cathode provide beneficial charging and discharging characteristics compared to conventional batteries.

This is clearly unlike *Kawakami* in view of *Fujita* and further in view of *Iwamoto,* which fails to disclose or suggest Appellant's claimed combination of 1) anode capacity component ratio X/Y, 2) light metal being deposited on the anode at an open circuit voltage lower than overcharge voltage, and 3) the capacity of the anode obtained by insertion and extraction of the light metal being smaller than the capacity of the cathode. Appellant submits that one having skill in the art would not have been taught by or received a suggestion from the cited references to arrive at Appellant's claimed invention.

As mentioned above, Appellant's combination of 1) anode capacity component ratio X/Y (claim element "1)"), 2) light metal being deposited on the anode at an open circuit voltage lower than overcharge voltage (claim element "2)"), and 3) the capacity of the anode obtained by insertion and extraction of the light metal being smaller than the capacity of the cathode (claim element "3)") beneficially provides improved charging and discharging characteristics compared to conventional batteries. This benefit graphically depicted in the illustrative examples of Exhibit Figures (3), (4), (5), and (6).

As acknowledged by the Examiner, *Kawakami* and *Iwamoto* each fails to teach claim element 1) an anode capacity component ratio X/Y that is at least 0.05 to at most 3.0, X being the capacity component obtained by deposition and dissolution of the light metal and Y being the capacity component obtained by insertion and extraction of the light metal. *Kawakami* and *Iwamoto* each fails to even teach an anode capacity component that is based on deposition and dissolution of a light metal. Instead, *Kawakami* and *Iwamoto* merely relate to an anode capacity that is based on insertion and extraction of a light metal. Further, the Examiner acknowledges that *Kawakami* and *Iwamoto* each fails to teach claim element 2) a light metal being deposited on

the anode at an open circuit voltage lower than overcharge voltage. *Office Action of 12/28/2007,* page 3.

Fujita teaches claim element 1) an anode capacity component ratio X/Y that is at least 0.05 to at most 3.0, X being the capacity component obtained by deposition and dissolution of the light metal and Y being the capacity component obtained by insertion and extraction of the light metal, and claim element 2) a light metal being deposited on the anode at an open circuit voltage lower than overcharge voltage. However, *Fujita* fails to teach or suggest claim element 3) the capacity of an anode being obtained by the insertion and extraction of a light metal being smaller than the capacity of a cathode. *Fujita* fails to discuss this claimed subject matter.

Kawakima describes generally that its "cathode capacity was made to be larger than [its] anode capacity". *Kawakima* 29:52-54. However, *Kawakima* fails to describe why it uses a cathode capacity that is larger than its anode capacity, and thus fails to provide any suggestion as to any benefit resulting therefrom.

Therefore, Appellant respectfully submits that one having skill in the art would not have received a suggestion from *Kawakima* to include an cathode capacity that is larger than an anode capacity in *Fujita's* device. *Fujita* fails to discuss cathode capacity versus anode capacity. And *Kawakima* fails to discuss why it uses an cathode capacity that is larger than an anode capacity.

Further, *Fujita* fails to provide any suggestion on why its device, which has an anode capacity that is based in part on deposition and dissolution and in part on insertion and extraction, should be combined with *Kawakima's* device, which has an anode capacity that is based exclusively on insertion and extraction, to provide the beneficial result achieved by Appellant's claimed invention. In other words, there is simply no suggestion by the references, taken singly or in combination, to combine 1) anode capacity component ratio X/Y (claim element "1)"), 2) light metal being deposited on the anode at an open circuit voltage lower than overcharge voltage (claim element "2)"), and 3) the capacity of the anode obtained by insertion and extraction of the light metal being smaller than the capacity of the cathode (claim element "3)") to beneficially arrive at the improved charging and discharging characteristics of Appellant's claimed invention. Appellant respectfully submits the Examiner has used impermissible hindsight to combine the cited art to arrive at Appellant's claimed invention.

For at least these reasons, *Kawakami* in view of *Fujita* and *Iwamoto* fails to disclose or suggest claim 1.

Claims 4-5, 7-11, 13-16, and 18-20 depend directly or indirectly from claim 1 and are therefore allowable for at least the same reasons that claim 1 is allowable.

Appellant respectfully submits the rejection has been overcome and requests that the Board reverse the rejection.

B. Claim 17 is not rendered obvious by *Kawakami* in view of *Fujita* and *Iwamoto* and further in view of *Morigaki*

Appellant respectfully disagrees with the rejection.

Independent claim 1 is allowable over *Kawakami* in view of *Fujita* and *Iwamoto* as discussed above. *Morigaki* also fails to disclose or suggest Appellant's claimed combination of 1) anode capacity component ratio X/Y, 2) light metal being deposited on the anode at an open circuit voltage lower than overcharge voltage, and 3) the capacity of the anode obtained by insertion and extraction of the light metal being smaller than the capacity of the cathode. Therefore, *Kawakami* in view of *Fujita* and *Iwamoto* further in view of *Morigaki* fails to disclose or suggest claim 1.

Claim 17 depends directly or indirectly from claim 1 and is therefore allowable for at least the same reasons that claim 1 is allowable.

Appellant respectfully submits the rejection has been overcome and requests that the Board reverse the rejection.

C. Claim 12 is not rendered obvious by *Kawakami* in view of *Fujita* and *Iwamoto* and further in view of *Yoshioka*

Appellant respectfully disagrees with the rejection.

Independent claim 1 is allowable over *Kawakami* in view of *Fujita* and *Iwamoto* as discussed above. *Yoshioka* also fails to disclose or suggest Appellant's claimed combination of 1) anode capacity component ratio X/Y, 2) light metal being deposited on the anode at an open circuit voltage lower than overcharge voltage, and 3) the capacity of the anode obtained by insertion and extraction of the light metal being smaller than the capacity of the cathode. Therefore, *Kawakami* in view of *Fujita* and *Iwamoto* further in view of *Yoshioka* fails to disclose or suggest claim 1.

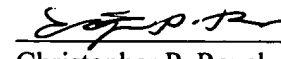
Claims 12 depends directly or indirectly from claim 1 and is therefore allowable for at least the same reasons that claim 1 is allowable.

Appellant respectfully submits the rejection has been overcome and requests that the Board reverse the rejection.

VIII. CONCLUSION:

For the foregoing reasons, Appellant respectfully submits the rejections posed by the Examiner are improper as a matter of law and fact. Accordingly, Appellant respectfully requests that the Board reverse the rejections of claims 1-5 and 7-19.

Respectfully submitted,



(Reg. No. 45,034)

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Attorneys for Appellants

CLAIMS APPENDIX

1. (Previously presented) A battery comprising a cathode, an anode, and an electrolyte, wherein,

(a) the capacity of the anode includes both of a capacity component obtained by insertion and extraction of a light metal and a capacity component obtained by deposition and dissolution of the light metal,

(b) the electrolyte contains a light metal salt having a M-O bond wherein M represents any of boron (B), phosphorus (P), aluminum (Al), gallium (Ga), indium (In), thallium (Tl), arsenic (As), antimony (Sb) or bismuth (Bi),

(c) the light metal is deposited on the anode at an open circuit voltage lower than overcharge voltage,

(d) a ratio X/Y is at least 0.05 to at most 3.0, X being the capacity component obtained by deposition and dissolution of the light metal and Y being the capacity component obtained by insertion and extraction of the light metal, and

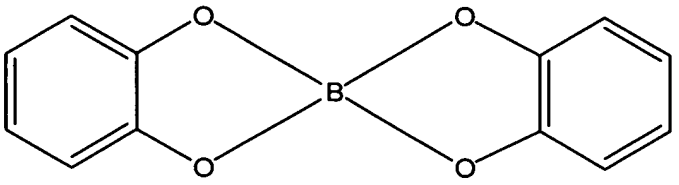
(e) the capacity of the anode obtained by insertion and extraction of the light metal is smaller than the capacity of the cathode.

2. (Previously presented) A battery according to claim 1, wherein the light metal salt has a B--O bond or a P--O bond.

3. (Previously presented) A battery according to claim 1, wherein the light metal salt has a O--B--O bond or a O--P--O bond.

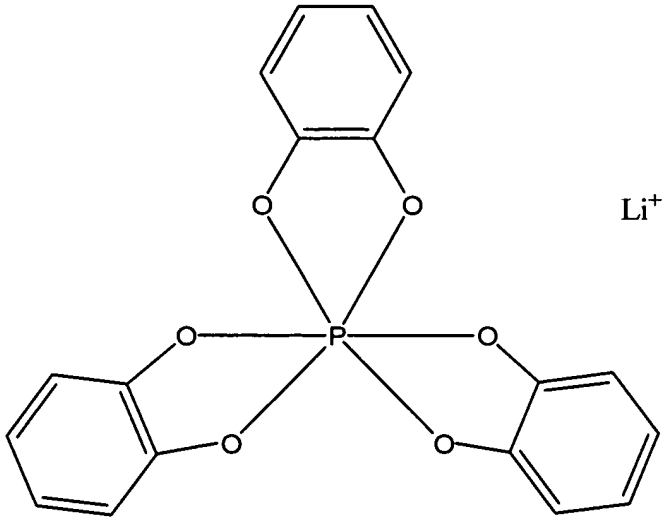
4. (Previously presented) A battery according to claim 1, wherein the light metal salt comprises a cyclic compound.

5. (Previously presented) A battery according to claim 1, wherein the light metal salt is selected from the group consisting of lithium bis[1,2-benzenediolato (2-)-O,O'] borate of Chemical Formula 3:



,

lithium tris [1,2-benzenediolato (2-)-O,O'] phosphate of Chemical Formula 4:



,

and a mixture thereof.

6. (Canceled)

7. (Previously presented) A battery according to claim 1, wherein the anode comprises a carbon material.

8. (Previously presented) A battery according to claim 7, wherein the anode comprises at least one material selected from the group consisting of graphite, a graphitizable carbon and a non-graphitizable carbon.

9. (Previously presented) A battery according to claim 8, wherein the anode comprises graphite.

10. (Previously presented) A battery according to claim 1, wherein the anode comprises at least one material selected from the group consisting of a metal element and a metalloid,

wherein said material can form an alloy with the light metal.

11. (Previously presented) A battery according to claim 10, wherein the anode contains at least one element selected from the group consisting of tin (Sn), lead (Pb), aluminum, indium, silicon (Si), zinc (Zn), antimony, bismuth, cadmium (Cd), magnesium (Mg), boron, gallium, germanium (Ge), arsenic, silver (Ag), zirconium (Zr), yttrium (Y), and hafnium (Hf).

12. (Original) A battery according to claim 1, wherein the electrolyte contains a polymeric compound or an inorganic solid electrolyte.

13. (Original) A battery according to claim 1, wherein the electrolyte further contains $LiPF_6$.

14. (Previously presented) A battery according to claim 1, wherein the electrolyte further contains $LiBF_4$.

15. (Original) A battery according to claim 1, wherein the electrolyte further contains $LiN(CF_3SO_2)_2$.

16. (Original) A battery according to claim 1, wherein the electrolyte further contains $LiN(C_2F_5SO_2)_2$.

17. (Original) A battery according to claim 1, wherein the electrolyte further contains $LiC(CF_3SO_2)_3$.

18. (Original) A battery according to claim 1, wherein the electrolyte further contains $LiClO_4$.

19. (Previously presented) A battery according to claim 1, wherein the light metal is lithium.

20-21. (Canceled)

EVIDENCE APPENDIX

In the Amendment mailed on April 28, 2008, Appellant submitted six Figures as evidence to facilitate understanding of Appellant's claimed invention and its differences from the cited references. These six Figures are resubmitted herewith on three drawing sheets:

Exhibit Figure (1) insertion/extraction of Li+

Exhibit Figure (2) before charging stage

Exhibit Figure (3) charging 1st stage

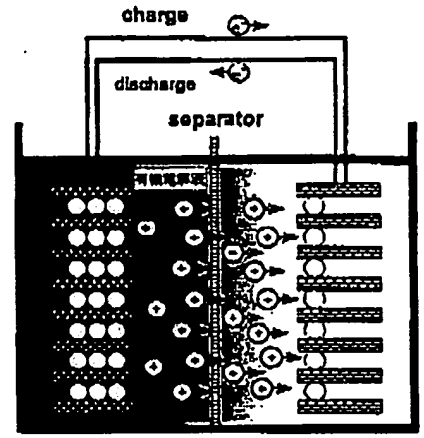
Exhibit Figure (4) charging 2nd stage

Exhibit Figure (5) discharging 1st stage

Exhibit Figure (6) discharging 2nd stage

insertion/extraction of Li^+

(Conventional Li-ion battery)

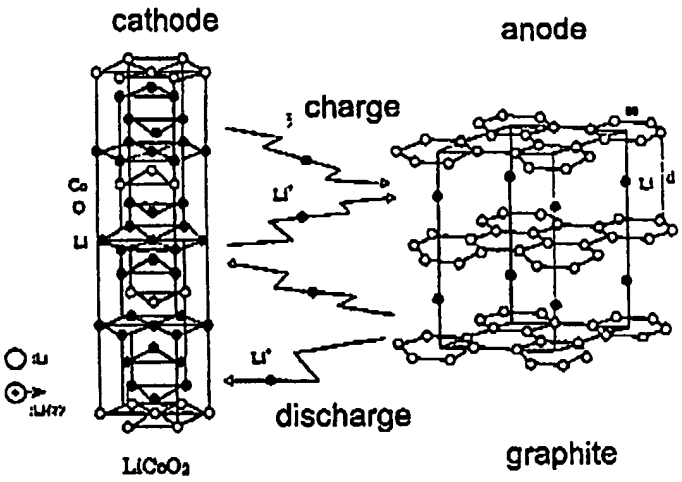


正極：$LiCoO_2$
(intercalation compound)

負極：炭素質
(intercalation compound)

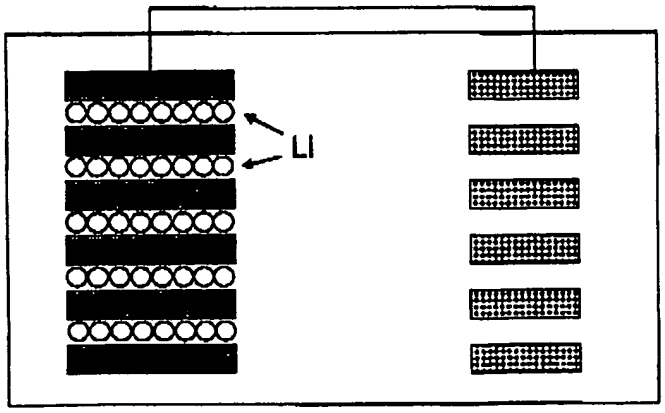
cathode
(positive electrode)

anode
(negative electrode)



1

Before Charging Stage



cathode
($LiCoO_2$)

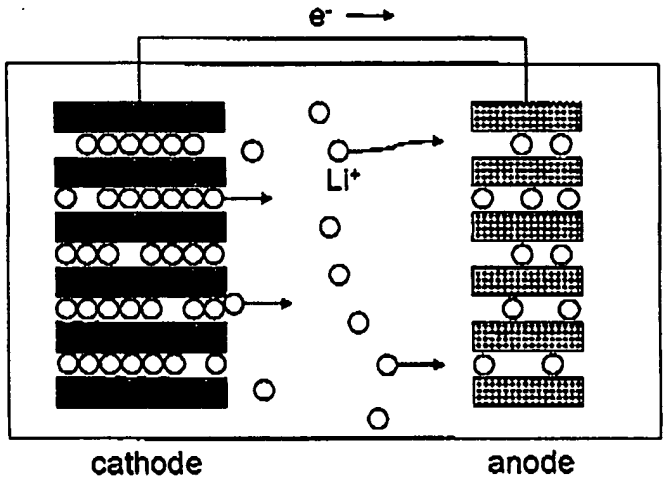
anode
(graphite)

2

Charging 1st Stage

Li^+ insert to anode

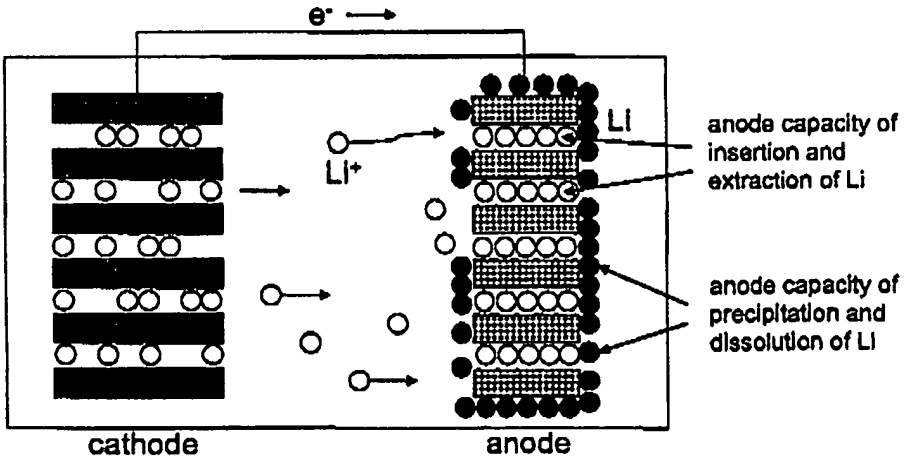
(Conventional Li-ion battery stage)



Charging 2nd Stage

Li precipitate (deposite) to anode

(Li on anode : special feature of this invention)



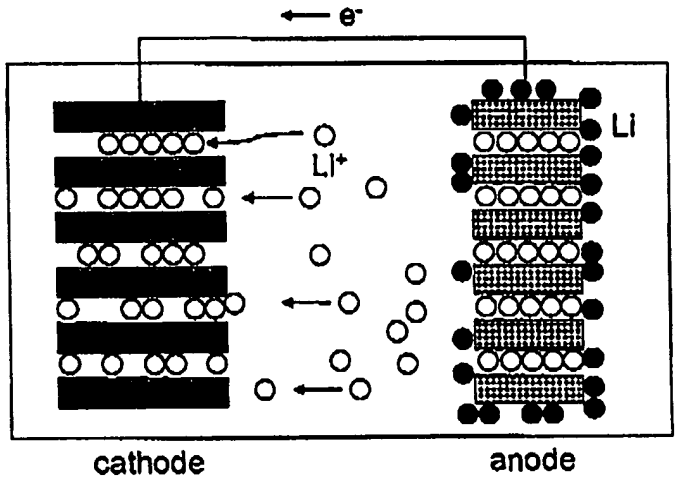
cathode capacity (insertion and extraction of Li)	>	anode capacity of insertion and extraction of Li

cathode capacity = anode capacity of insertion and extraction of Li and precipitation and dissolution of Li

Discharging 1st Stage

Li dissolve from anode

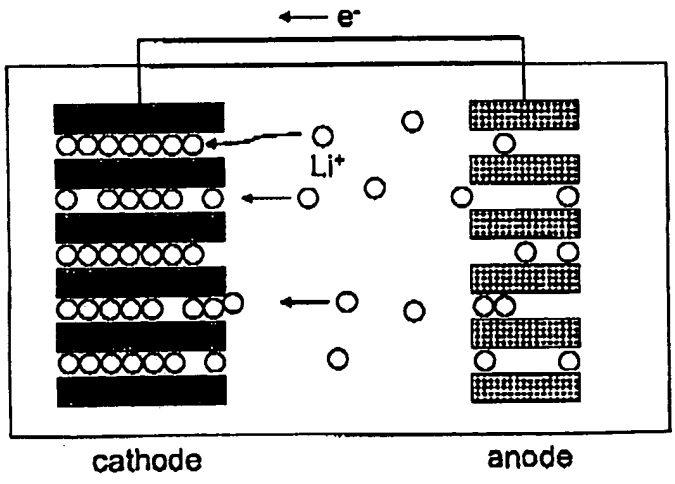
(Li on anode : special feature of this invention)



Discharging 2nd Stage

Li^+ extract from anode

(Conventional Li-ion battery stage)



RELATED PROCEEDINGS APPENDIX

Appellant is not aware of any related appeals or interferences with regard to the present application.